Portfolio Choice in Retirement: Health Risk and the Demand for Annuities, Housing, and Risky Assets*

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1. Introduction

As a large cohort of baby boomers approach retirement, the design of products that ensure the lifetime financial security of retirees is at the forefront of the agenda in the financial industry. In public policy, there is active debate on whether the Social Security system can be reformed to improve the welfare of present and future retirees. Despite this interest, little is understood about the asset allocation decisions of retirees. Although there is a large literature that studies life-cycle asset allocation in the working phase when households face labor-income risk, there is relatively little work on asset allocation in retirement when households face health risk. This paper attempts to fill this gap in the literature by providing a positive (in contrast to normative) analysis of life-cycle asset allocation during retirement.

Specifically, this paper develops a consumption and portfolio-choice model in which a retiree faces exogenous and stochastic depreciation of health, which affects the marginal utility of wealth as well as life expectancy. The retiree chooses health expenditure endogenously based on her health, wealth, and health insurance coverage. In addition, the retiree makes an asset allocation decision between a riskless bond, a risky asset, a real annuity, and housing. I calibrate the model using data on health expenditure, general health status, and asset holdings for a population of retired females in the Health and Retirement Study (HRS), aged 65 and older. The model successfully explains the cross-sectional distribution as well as the joint evolution of health expenditure, health, and the allocation of wealth in retirement.

2. Main Contributions

This paper makes two contributions to the literature on portfolio choice in retirement. First, this paper takes a comprehensive view of portfolio choice, which reflects the reality that retirees own sophisticated portfolios allocated across four major asset classes: bonds (including cash), risky assets (including stocks and private businesses), annuities (mostly through defined benefit pension plans and Social Security), and housing. Related models of portfolio choice in retirement focus only on a subset of these four asset classes, which is a simplification that is primarily useful for normative analysis (e.g., Turra and Mitchell, 2004; Inkmann, Lopes, and Michaelides, 2007; Love and Perozek, 2007; Pang and Warshawsky, 2007; Edwards, 2008).

The second contribution is to build a more realistic model of health risk in which health expenditure (e.g., a doctor visit) is an endogenous response to realized health risk (e.g., developing a back pain). The previous literature has taken one of two extreme positions on
modeling health risk. On the one hand is a complete market in which all health risk is insurable and uncertainty arises only over the time of death. In such a world, a retiree without a bequest motive should fully annuitize wealth (Yaari, 1965; Friedman and Warshawsky, 1990; Davidoff, Brown, and Diamond, 2005). On the other hand is an incomplete market in which health expenditure is exogenous and stochastic, essentially modeled as negative income shocks. The inability to insure uncertainty over health expenses generates large precautionary saving in liquid assets and crowds out the demand for annuities (Hubbard, Skinner, and Zeldes, 1994; Palumbo, 1999; Sinclair and Smetters, 2004; De Nardi, French, and Jones, 2006).

This paper takes a position between these two extremes, that health risk is neither fully insurable nor entirely exogenous. A model with exogenous health expenses overstates the degree to which markets are incomplete with respect to health risk. In reality, retirees have an ability to endogenously adjust their health expenditure in response to changes in their health and wealth. Moreover, retirees may have an ability to change the distribution of future health risk (e.g., developing cancer) through endogenous investment in health (e.g., getting a mammogram). Overall, the endogeneity of health expenditure reduces the amount of background risk with respect to health, which has important implications for consumption and portfolio choice. This is analogous to the idea that the endogeneity of the labor supply (including the timing of retirement) reduces the amount of background risk with respect to labor income (Bodie, Merton, and Samuelson, 1992).

Another advantage of a model with endogenous health expenditure is the ability to conduct welfare analysis of new financial products. A model with exogenous health expenses is not well suited for welfare analysis because an alternative market structure can change the endogenous accumulation of health. In this paper, I ask whether current retirees are sufficiently annuitized through defined benefit pension plans and Social Security. Using the calibrated model, I conduct welfare analysis of an annuity market that allows retirees to privately annuitize their wealth during retirement.

3. Welfare Analysis of Private Annuitization

Almost all individuals enter retirement with implicit annuity holdings, either through a defined benefit pension plan or Social Security. Very few retirees purchase additional annuities through private insurance markets, presumably due to various market frictions and participation costs (see Brown, 2007, for a survey). In the benchmark model, I model the present situation by not allowing retirees to trade annuities during retirement. I then relax this constraint and allow the retiree to purchase additional annuities in any period during re-
retirement. In modeling an annuity market, I adopt two important institutional features of the private annuity market in the United States. First, the pricing of annuities is contingent on age but not on health, calibrated to private insurance rates (Mitchell, Poterba, Warshawsky, and Brown, 1999). Second, annuities are illiquid in the sense that the retiree cannot sell them back to the insurer (due to the possibility of adverse selection).

The presence of an annuity market causes a large reallocation from bonds and stocks to annuities. This suggests that much of the liquid asset holdings in the benchmark model are a consequence of longevity risk, rather than precautionary saving arising from uncertainty over health expenses. Importantly, the presence of an annuity market also reduces saving in one’s own health through health expenditure. In other words, the same frictions that prevent private annuitization appear to be linked to the high demand for health care.

I calculate the welfare gain from private annuitization by comparing the value function in the model with an annuity market with that in the benchmark model (Brown, 2001). The welfare gain, as a percentage of tangible wealth at age 65, is 13.4 percent for those in poor health, 13.8 percent for those in fair health, 14.8 percent for those in good health, 15.8 percent for those in very good health, and 18.0 percent for those in excellent health. The fact that the welfare gain rises in health is consistent with survey evidence that healthier retirees prefer the annuity income of Social Security to an actuarially equivalent lump-sum payment (Brown, Casey, and Mitchell, 2008). To put these numbers into perspective, Mitchell, Poterba, Warshawsky, and Brown (1999) find a welfare gain of about 40 percent in a model without health expenses or a bequest motive. In other words, health expenses and a bequest motive can partly, but not entirely, explain the so-called annuity puzzle.

4. Future Work

There are several issues that I have not examined, which are worth addressing in future work. First, the model can be used to assess the welfare implications of other retirement financial products, such as variable annuities and reverse mortgages (e.g., Horneff, Maurer, Mitchell, and Stamos, 2007). Second, the model can be extended to married households, in which consumption and portfolio choice depend on the health and survival of both partners (e.g., Lillard and Weiss, 1997; Jacobson, 2000; Love, 2008). Finally, the horizon can be extended to include the working phase prior to retirement. A number of interesting issues then arise such as the correlation between health and labor-income risk (e.g., Grossman, 1972; Hugonnier, Pelgrin, and St-Amour, 2009) and the optimal timing of retirement (e.g., Farhi and Panageas, 2007; Chai, Horneff, Maurer, and Mitchell, 2009). Both health status and access to health insurance can affect the timing of retirement, and consequently, con-
sumption and portfolio decisions (e.g., French and Jones, 2007; Blau and Gilleskie, 2008).

References


